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10/763,099

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Charles Frank

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EXAMINER

DILLON, SAMUEL A

ART UNIT

PAPER NUMBER

2185

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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|------------------------------|--------------------------------------|-------------------------------------|--|
| Office Action Summary | Application No. 10/763,099 | Applicant(s) FRANK ET AL. | |
| | Examiner SAMUEL DILLON | Art Unit 2185 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 April 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 10-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 10-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The Examiner acknowledges the applicant's submission of the amendments dated April 7, 2008 and April 15, 2008. Per the amendments, Claims 1, 5, 6, 8 and 11 have been amended.

I. RESPONSE TO AMENDMENT(S) / ARGUMENT(S)

2. Applicant's arguments with respect to the 35 U.S.C. 103(a) rejections of Claims 1—and 10-16 have been fully considered but they are **not persuasive**. The rejections have been upheld, and the Applicant directed below for traversal.

3. **The Applicant contends that Wang as combined with Anderson does not disclose storage areas being peer addressable.** The Examiner respectfully disagrees.

4. Anderson discloses a system of many nodes which can have several different roles, including storage server, client, cleaner and manager (*figure 2*). These nodes are clearly peer nodes, as they all connect to each other via the network, are able to be configured to perform a subset of the roles needed and operate in a serverless configuration (*figure 2 and description*). Accordingly, the Examiner asserts that Wang as combined with Anderson clearly discloses storage areas being peer addressable.

5. Regarding all other Claims not specifically traversed above and whose rejections were upheld, the Applicant contends that the listed claims are allowable by virtue of their dependence on other allowable claims. As this dependence is the sole rationale put forth for the allowability of said dependent claims, the Applicant is directed to the Examiner's remarks above. Additionally, any other arguments the Applicant made that were not specifically addressed in this Office Action appeared to directly rely on an argument presented elsewhere in the Applicant's response that was traversed, rendered moot or found persuasive above.

II. REJECTIONS BASED ON PRIOR ART

Claim Rejections - 35 USC ' 103 - Wang and Anderson

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. **Claims 1, 3-8, 10 and 11** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (*US Patent 6,834,326*) in view of Anderson et al. ("*Serverless Network File Systems*").

8. As per **Claim 1**, Wang disclose(s) a storage system comprising a redundant array of peer-addressable multicast storage areas (*column 2 lines 24-26*) accessible as peers by a first client (*one of the plurality of clients, column 1 lines 29-39*) having a first RAID controller (*figure 5*) and accessible as peers by a second client having the same RAID controller (*another of the plurality of clients, col. 1 lines 29-39*). Wang does not appear to disclose the second client having a second RAID controller that is independent from the first RAID controller.

Anderson discloses a serverless network filesystem that distributes storage and control over multiple computers (*right most architecture, figure 2*). At the time of the invention, it would have been obvious to modify Wang to utilize a serverless setup as taught by Anderson and broadcast the multicast packets to each storage device from each respective client.

Anderson specifically discloses that it is not only possible but desirable to have a serverless RAID system (*Anderson, section 2.1*), so the motivation for doing so would have been that it eliminates the necessity of special purpose hardware and also for a performance gain (*Anderson, section 2.1, paragraph 2*). Therefore, it would have been obvious to modify

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Wang to replace the RAID controller/switch with a set of clients with distributed control over the storage system, as taught by Anderson, to obtain the invention of Claim 1.

9. As per **Claim 3**, Wang and Anderson disclose(s) the storage system of Claim 1, wherein the storage areas of the redundant array share a common multicast address (*Wang, implied in column 2 lines 38-43, due the multicast packet being received by all of them and multicast packets having a timeout threshold that limits their range*).

10. As per **Claim 4**, Wang disclose(s) the storage system of Claim 1, comprising a plurality of RAID sets wherein each raid set comprises a plurality of storage areas sharing a common multicast address (*Wang, implied in column 2 lines 38-43*).

11. As per **Claim 5**, Wang and Anderson disclose(s) a network comprising a first device (*Anderson, any of the clients on the right most architecture, figure 2*), a second device (*Anderson, any other client on the right most architecture, figure 2*), and a plurality of storage devices wherein the first device stores a unit of data on a peer-addressable storage area located on each of the storage devices via a single multicast packet (*Wang, as combined, column 2 lines 40-43*) wherein the second device stores a second unit of data on each of the storage devices via a second single multicast packet (*Wang, as combined, column 2 lines 40-43*); and wherein first device and the second device do not require a common RAID controller to store data on the plurality of storage devices.

12. As per **Claim 6**, Wang and Anderson disclose(s) a network of multicast devices which are operable with a plurality of clients each having an independent RAID controller (*Anderson, right most architecture, figure 2*), and which disaggregate at least one RAID function across multiple peer-addressable multicast addressable storage areas (*Wang, col. 2 lines 24-28*).

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13. As per **Claim 7**, Wang and Anderson disclose(s) the network of Claim 6 wherein the at least one RAID function is also disaggregated across multiple device controllers (*Wang, each device inherently has a controller of some sort, column 2 lines 24-28*).

14. As per **Claim 8**, Wang and Anderson disclose(s) a storage system comprising a redundant array of peer-addressable, multicast storage areas (*Wang, column 2 lines 24-26*) accessible by a plurality of clients having independent RAID controllers (*Anderson, as combined, clients in right most architecture, figure 2*), wherein the system supports auto-annihilation of mooted read requests (*Wang, duplicate copies are ignored, column 6 lines 50-54*) by disregarding such requests (*Wang, when a read request on a mirrored system is received and responded to, in effect the responder tells the requestor to disregard the same read request in that the requestor will disregard all other response to the read request, col. 6 lines 50-54*).

15. As per **Claim 10**, Wang and Anderson disclose(s) the system of Claim 8 wherein auto-annihilation comprises a device that received a read request disregarding the read request if a response to the read request from another device is detected (*Wang, column 6 lines 50-54*).

16. As per **Claim 11**, Wang and Anderson disclose(s) a storage system comprising a dynamic mirror (*Wang, as combined, column 4 lines 46-47*) accessible by a first client having a first RAID controller and accessible by a second client having a second RAID controller independent from the first RAID controller (*Anderson, as combined, right most architecture, figure 2*), and wherein the dynamic mirror comprises peer-addressable storage areas that are accessible as peers by the first and the second client (*Anderson, figure 2*).

Claim Rejections - 35 USC ' 103 – Wang, Anderson and Kim

17. **Claim 2** is rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (*US Patent Number 6,834,326*) and Anderson et al. (*"Serverless Network File Systems"*) as combined above, in further view of Kim et al. (*Internet Multicast Provisioning Issues for Hierarchical Architecture*).

18. As per **Claim 2**, Wang and Anderson disclose(s) the storage system of Claim 1, wherein the multicast storage areas are adapted to communicate across a network via packets (*Wang, column 3 lines 24-33*), but does not disclose the further limitations of Claim 2. Kim discloses communicating across a network via split-ID packets (*Kim, section 2.3*) comprising both an encapsulating packet and an encapsulated packet (*Kim, section 2.3 paragraphs 1-2*); and

each split-ID packets also includes an identifier that is split such that a portion of the identifier is obtained from the encapsulated packet while another portion is obtained from a header portion of the encapsulating packet (*section 2.3 paragraphs 1-2*).

Wang, Anderson and Kim are analogous art in that they both deal with multicast network protocols. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to use Kim's IP-in-IP encapsulation procedure on Wang and Anderson's storage network.

The motivation for doing so would have been that it supports security in the IP layer (*Kim, section 3 paragraph 2*) and that it solves some scalability issues and has easier implementation aspects (*Kim, section 5 paragraph 1*).

Therefore, it would have been obvious to combine Wang and Anderson's storage system with Kim's IP-in-UP encapsulation procedure for the benefit of security, scalability and easier implementation, to obtain the invention of Claim 2.

Claim Rejections - 35 USC ' 103 – Wang, Anderson and Lin

19. **Claims 12-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. (*US patent Number 6,834,326*) and Anderson et al. ("*Serverless Network File Systems*") as combined above, and in view of Lin et al. ("*RMPT: A Reliable Multicast Transport Protocol*").

20. As per **Claim 12**, Wang and Anderson disclose(s) the storage system of Claim 11 wherein the dynamic mirror includes a mirrored storage area (*Wang, column 4 lines 46-47*), but for the purposes of this rejection does not disclose at least one corresponding map of incomplete writes.

Lin discloses a map of incomplete writes (*figure 5, page 1418*).

Wang, Anderson and Lin are analogous art in that they both deal with multicast network protocols. At the time of the invention, it would have been obvious to modify Wang and Anderson's multicast system to utilize Lin's RMTP protocol.

The motivation for doing so would have been that RMTP is a reliable protocol that avoids the acknowledgement implosion and propagation delays in wide area networks (*Lin, page 1415, left hand column, paragraph 3*).

Therefore, it would have been obvious to modify Wang and Anderson's system to use the RMTP protocol as taught by Lin for the benefit of being reliable, avoiding acknowledgement implosion and delays, to obtain the invention of Claim 12.

21. As per **Claim 13**, Wang, Anderson and Lin disclose(s) the storage system of Claim 11 wherein the dynamic mirror comprises N storage devices (*Wang, column 4 lines 46-47*) and M maps of incomplete writes where M is at least 1 and at most $2*N$ (*Lin, figure 5, page 1418*).

22. As per **Claim 14**, Wang, Anderson and Lin disclose(s) the storage system of Claim 13 wherein the map comprises a set of entries wherein each entry is either an LBA (*Lin, interpreted*

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as per the specification as being a logical block address) or a hash of an LBA of a storage block of a storage area being mirrored.

23. As per **Claim 15**, Wang, Anderson and Lin disclose(s) the system of Claim 13 comprising at least one process monitoring storage area ACKs (*interpreted as per the specification as being an acknowledgement signal or packet of some sort*) sent in response to write commands, the process updating any map associated with a particular area whenever a write command applicable to the area is issued (*Lin, page 1418 left-hand column paragraphs 3-4*), the process also sending an ACK on behalf of any storage area for which the process did not detect an ACK (*Lin, inherently implied in that if the sender does not receive an ACK it assumes it received an ACK, section 3.3 paragraph 3*).

24. As per **Claim 16**, Wang, Anderson and Lin disclose(s) the system of Claim 15 wherein updating a map comprises setting a flag whenever an ACK is not received (*Lin, section 3.3 paragraph 3 states that the sender assume, in the absence of an ACK there is no problem, and page 1418 left-hand column paragraph 3 states that swin_lb and avail_win are increased*) and clearing a flag whenever an ACK is received (*Lin, when data is sent, send_next is increased, which can be construed as clearing by writing a new value to, page 1418 left-hand column paragraph 3*).

III. CLOSING COMMENTS

25. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

a. **STATUS OF CLAIMS IN THE APPLICATION**

26. The following is a summary of the treatment and status of all claims in the application as recommended by M.P.E.P. ' 707.07(i):

a(1). **CLAIMS NO LONGER IN THE APPLICATION**

27. Claim 9 was cancelled by amendment.

a(1). **CLAIMS REJECTED IN THE APPLICATION**

28. Per the instant office action, Claims 1-8 and 10-16 have received an action on the merits and are subject of a final action.

b. **DIRECTION OF FUTURE CORRESPONDENCES**

29. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sam Dillon whose telephone number is 571- 272-8010. The examiner can normally be reached on 9:30-6:00.

30. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sanjiv Shah can be reached on 571-272-4098. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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IMPORTANT NOTE

31. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SAD

Sam Dillon
Examiner
Art Unit 2185

/Sanjiv Shah/
Supervisory Patent Examiner, Art Unit 2185